CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Mechanical properties of metals can be changed by thermo-mechanical processing. This is typically done by combining various types of mechanical deformation and annealing processes. One stage of annealing process is the static recovery process which occurs at temperature below recrystallization temperature and without mechanical deformation effect. Static recovery usually involve motion annihilation of point deflects as well as annihilation and rearrangement of dislocation resulting in the formation of subgrain and subgrain boundaries.

A unique feature of recovery process is that it does not involve any change in the grain structure of the cold worked metal. The only changes taking place are the dislocation arrangement within existing grain. This project will study about static recovery of aluminium-copper alloy. By using static recovery behavior, it will be then used to develop a mathematical model using Fridel's model. The mathematical model will be useful as a tool for predicting commercial product of mechanical properties.

1.2 PROBLEM STATEMENT

To investigate of static recovery process due to influence of pre-strain of aluminium-copper alloy.

1.3 THE OBJECTIVE OF THE RESEARCH

To validate Friedel's model of static recovery process of aluminium-copper alloy for tensile test with the pre-strain 5% at different temperature and time.

1.4 SCOPES OF THE PROJECT

This research is focus on the effect of pre-strain due to static recovery process at different time and temperature. The scopes of this project are:

(i) The material that used in this project which is limited to aluminium-copper alloy.
(ii) Operate lathe machine to making the specimens.
(iii) Annealing using box furnace.
(iv) Pre-strain at 2.5%, 5%, 7.5% and 10%
(v) Test specimen using tensile test machine.

CHAPTER 2

LITERATURE REVIEW

2.1 ANNEALING PROCESS

Annealing is one of the processes of heat treatment. Heat treatment is the process that involves the heating and cooling process for the purpose of achieving the desired mechanical properties and performance of a material by changing its microstructure or its residual stress pattern.

In the annealing process the structure and properties of the material will changes after heated and held at suitable temperature and then cooled at a fairly slow rate. There are three stage of annealing process which is recovery, recrystalization and grain growth. This process will occur due to the increasing of temperature.

The purpose of the annealing process is to reduce hardness, refine the grain structure, restore ductility, and remove internal stresses of the material. This process also will improving machinability, facilitating cold working, producing a desired microstructure and obtaining desired physical, mechanical, or other properties.

Figure 2.1 show the effect of structure and properties of the material due to increasing of temperature. In this research, the annealing process that involve is the static recovery stage. At the static recovery stage the internal residual stress will decrease while the ductility will decrease and no changes occur for strength.